imaging, carotid duplex ultrasound criteria, and ultimately, threshold for surgery. We sought to identify national variation in preoperative imaging, duplex ultrasound criteria, and surgical intervention threshold for asymptomatic CEA.

Methods: The Society for Vascular Surgery Vascular Quality Initiative (VQI) database was used to identify all CEA procedures performed for asymptomatic carotid artery stenosis between 2003 and 2014. VQI currently captures 100% of CEA procedures performed at >270 centers by >2000 physicians nationwide. Three analyses were performed to quantify the variation in 1) preoperative imaging modality, 2) duplex ultrasound criteria, and 3) degree of stenosis threshold used for CEA.

Results: Of 35,695 CEA procedures in 33,488 patients, 19,610 (55%) were performed for asymptomatic disease. The preoperative imaging modality varied widely, with 53% of patients receiving a single imaging study (duplex ultrasound, 41%; computed tomography angiography, 8.3%; magnetic resonance angiography, 2.5%; cerebral angiography, 1.1%) and 47% receiving multiple preoperative imaging studies. Of the 16,997 asymptomatic patients (87%) who underwent a preoperative duplex ultrasound study, there was significant variability between centers in the degree of stenosis (50%-69%, 70%-79%, 80%-99%) designated for a given peak-systolic velocity, end-diastolic velocity, and internal carotid artery/common carotid artery ratio. Although asymptomatic CEA procedures were performed in 68% of patients for an 80% to 99% stenosis, 26% were for a 70% to 79% stenosis, and 4.1% were for a 50% to 69% stenosis. At the center level, institutions range in the percentage of CEA procedures performed for a <80% asymptomatic carotid artery stenosis from 2.8% to 86%. At the surgeon level, surgeons ranged from 0.6% to 88% in the percentages of CEA procedures performed for a <80% asymptomatic carotid artery stenosis from 0.6% to 88%.

Conclusions: Despite CEA being an extremely common procedure, there is widespread variation in the three primary determinants—preoperative imaging, duplex ultrasound criteria, and treatment threshold—of whether CEA is performed for asymptomatic carotid stenosis. The observed variation likely has significant downstream effects that influence health care quality and health care costs, which may be improved with increased standardization of care.

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A New Era in Vascular Surgery Inpatient Care: Results of a Vascular Surgeon-Hospitalist Comanagement Service

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Objectives: Vascular surgery patients have increased medical comorbidities that amplify the complexity of care. We aim to assess the effect of a hospitalist comanagement service (HCS) on inpatient vascular surgery outcomes.

Methods: A total of 1059 patients were divided into two cohorts for comparison: 515 between January 2012 and December 2012 before the implementation of an HCS, and 544 between January 2013 and October 2013 after the initiation of an HCS. Nine vascular surgeons and 10 hospitalists participated in the HCS. End points measured were in-hospital mortality (IHM), length-of-stay (LOS), 30-day readmission rates (RAR), 0 to 10 visual analog scale pain scale scores, in-patient adult safety assessments using the Agency for Healthcare Research and Quality (AHRQ) Patient Safety Indicators (PSI), and resident perceptions assessed by survey.

Results: The IHM rate decreased from 1.75% to 0.37% after the implantation of the HCS ($P = .016$), with a decrease in the observed-to-expected (O/E) ratio from 0.89 to 0.22. The risk adjusted IHM decreased from 1.56% to 0.0008% ($P = .003$). Mean LOS was lower in the base period, 5.1days vs 5.5 days ($P < .001$), with an O/E ratio of 0.83 and 0.78, respectively. The risk adjusted LOS increased from 4.2 days to 4.3 days ($P < .001$). The overall 30-day RAR was unchanged, 23.1% compared with 22.8% ($P = .6$). The related 30-day RAR was also similar, 11.5% compared with 11.4% ($P = .5$). Patients reporting no pain during hospitalization increased from 72.8% before the HCS to 77.8% after ($P = .04$). Reports of moderate pain decreased from 14% to 9.6% ($P = .016$). Mild and severe pain scores were similar between the two groups. Adult safety measured by AHRQ demonstrated a decrease in the number of deaths among surgical patients with treatable complications from 3 to 0 patients ($P = .04$). Most house staff reported that the comanagement program had a positive effect on patient care and education.

Conclusions: The hospitalist comanagement service resulted in a significant decrease in in-hospital mortality rates, improved patient safety as measured by AHRQ, and lower pain scores. Resident surveys demonstrated perceived improvement in patient care and education. Continued observation will be necessary to assess the long-term effect of the HCS on quality metrics.

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Improved Access to Health Care in Massachusetts After 2006 Massachusetts Healthcare Reform Is Associated With a Significant Decrease in Mortality Among Vascular Surgery Patients

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Objectives: Timely access to care is directly impacted by insurance coverage and affects outcomes after vascular procedures. We evaluated trends of in-hospital mortality (IHM) for index vascular procedures so as to assess the effects of 2006 Massachusetts (MA) Healthcare Reform (MHR) on the mortality trends.

Methods: National Inpatient Sample (2003-2011) was queried to identify surgical patients with peripheral arterial disease, carotid stenosis, and abdominal aorta aneurysm based on International Classification of Diseases, Ninth Revision, Clinical Modification diagnostic and procedure codes. The cohort was then divided into MA and non-MA (NMA) based on the location of the hospital. Two time intervals, 2003-2006 (P1) and after 2006 (P2) were selected for comparisons. The patients at MA and NMA hospitals were described in terms of demographic characteristics and presentation by time interval (P1 vs P2) and compared using χ^2 and *t*-test. Weighted logistic regression with a term modeling change in the odds ratio for second time interval was used to test and estimate trends in mortality and to compare MA and NMA trends.

Results: We identified 306,438 patients operated on for peripheral arterial disease, carotid stenosis, and abdominal aortic aneurysm. MA and NMA cohorts were similar, with a significant increase in Elixhauser

Table. Annual change in in-hospital mortality after vascular operations

Contrast	*OR*	*95% CI*	P *value*
Overall annual change	0.93	0.90-0.97	<.001
2003-2006 (P1)	0.95	0.93-0.97	<.001
2007-2011 (P2)	1.02	0.96-1.08	.569
P2 vs P1			
MA annual change	1.05	0.85-1.29	.648
P1	0.78	0.67-0.91	.001
P2	0.74	0.56-0.99	.043
P2 vs P1			
Non-MA annual change	0.93	0.90-0.97	<.001
P1	0.95	0.93-0.98	<.001
P2	1.03	0.97-1.09	.405
P2 vs P1			
MA vs Non-MA (P1)	1.13	0.92-1.39	.26
MA vs Non-MA (P2)	0.82	0.70-0.95	.01

CI, Confidence interval; *MA*, Massachusetts; *OR*, odds ratio.

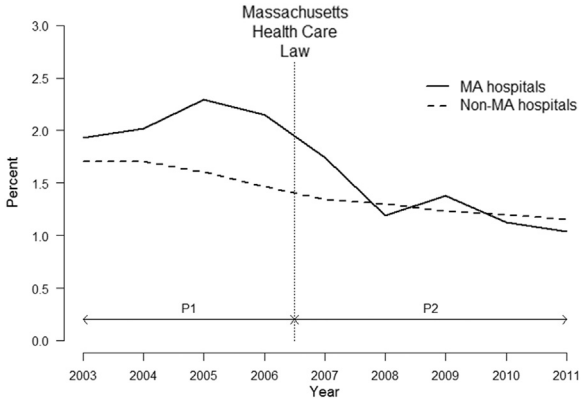

Fig. Mortality (moving average).